

Family Health Dataline

IN THIS ISSUE:

- The most common causes of infant death among 100 deaths examined during 1997 were preterm birth, congenital anomalies, infection, injury, and parental illicit drug use or alcohol abuse.
- 42% of examined infant deaths were potentially preventable, based upon the current state of scientific knowledge.
- The most common recommended interventions for potentially preventable deaths were parental education, improved social support, drug and alcohol cessation programs, better medical management of critically ill infants, and improved access to care.
- 15% of examined infant deaths were determined to be caused in part by maternal illicit drug use or alcohol abuse, and for an additional 21% of deaths parental (mainly maternal) illicit drug use or alcohol abuse was documented in the medical records.
- 19% of examined infant deaths were determined to be caused in part by injury, including 10% that were caused in part by overlying.

1997 Alaska Maternal-Infant Mortality Review Results

In this issue of the Family Health Dataline, we present the results of the 1997 Maternal-Infant Mortality Review (MIMR). Although we have used the same basic process as during previous years, the data collection instruments have changed substantially. Because this limits our ability to compare analysis from the previous year to analyses of past years, we present data only on infant deaths reviewed during September 1996 through August 1997. These deaths occurred during 1992 through 1996 and are not necessarily representative of all infant deaths which occurred in Alaska during that period.

Methodology

Previous issues of the Dataline have described in detail the MIMR process. Briefly, the Section of Maternal, Child, and Family Health, Alaska Division of Public Health attempts to acquire a standard set of information for each infant death that occurs in Alaska. This information is collected from infant and maternal medical records and birth and death certificates for all infants and, for some infants, autopsy reports, police reports, and home interviews. Once each month, two to four members of the MIMR Committee review eight to 12 infant deaths and identify the most likely underlying and contributing causes of death, whether the death was potentially preventable and potential factors that would have altered the

outcome. Once each year the entire MIMR Committee reviews the findings of the previous year and arrives at consensus recommendations based on these findings.

General

Overall, 100 infant deaths were reviewed during the period September 1996 through August 1997. Twelve of these deaths occurred during 1992, 14 during 1993, 12 during 1994, 36 during 1995, and 26 during 1996. Fifty-eight percent were male; 52% occurred in Anchorage, 8% in Fairbanks, 2% in Juneau, and the remaining 38% occurred elsewhere in the state; and 54% were Alaska Native, reflecting a

large backlog of Alaska Native records from previous years which had not been reviewed earlier because of difficulty obtaining complete records.

Cause of death

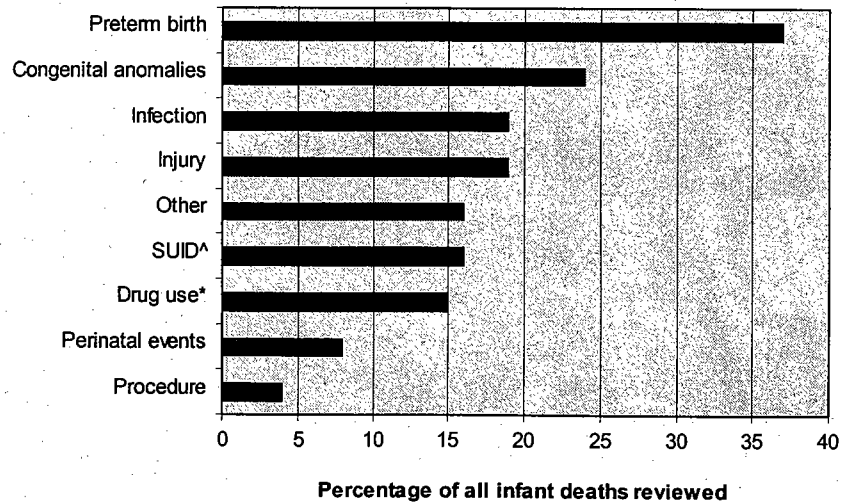
Results

As with previous reviews, the current review was a non-random sample of infant deaths and thus the causes of death reported here may not reflect the overall causes of death for 1992-96. Allowing for multiple causes of death, the MIMR Committee found that the most common causes of infant death were, in order, preterm birth, congenital anomalies (including nine with congenital heart disease, four with neural tube defects, two with chromosomal anomalies, and nine with a variety of other anomalies), infection, injury (over half of which may have been related to overlying), sudden unexplained infant death (including sudden infant death syndrome [SIDS]), and prenatal or postnatal parental illicit drug use or alcohol abuse, each of which was associated with more than 10% of infant deaths allowing for multiple causes (Figure 1).

Recommendations

- ♦♦Because of the continued importance of sudden unexplained infant deaths, including SIDS, as a potentially preventable cause of death and the previously reported association between SIDS and prone sleep position and maternal cigarette smoking (see Dataline editions for

Figure 1. Cause of death, allowing for multiple causes, for 100 Infant deaths which occurred during 1992-96. Alaska MIMR, 1997 Review.



^ Sudden unexplained infant death
* Parental illicit drug use/alcohol use

November 1995, and January, February, and October/November 1996) the committee recommends:

- > creating a "SIDS in Alaska" brochure to reflect the importance of these risk factors and distributing this with the Back to Sleep campaign materials
- > investigating the effectiveness of these educational efforts to alter behavior
- > having a core, consistent autopsy protocol for all sudden unexplained infant deaths.
- ♦♦The committee supports continuing programs, such as the Child Fatality Review, which include routine death scene investigations and thorough autopsies, and which allow the determination of causes of sudden unexplained infant deaths (the Child Fatality Review Team investigates all out-of-hospital child deaths

specifically to identify instances of intentional trauma where legal proceedings might be initiated).

- ♦♦Because of the continued importance of preterm birth as a cause of death, the committee recommends developing a subcommittee that will review Alaska-specific data in combination with relevant medical literature to develop recommendations for prevention programs. This subcommittee should collaborate with other groups, such as Alaska Neonatology Associates, that have a similar interest in developing preterm birth prevention programs.

Cause of death by race

Results

For the 100 reviewed deaths, Alaska Natives and non-Natives had a roughly equal proportion of deaths due to preterm birth,

congenital anomalies, infections, and perinatal events (Figure 2). A larger proportion of Alaska Native deaths were due to maternal substance use and injury while a greater proportion of non-Native deaths were due to sudden unexplained infant death, medical procedures (see under Preventable Infant Deaths below for a further description), and other causes. It cannot be overemphasized that, because deaths that were reviewed were not necessarily representative of all Alaska Native and non-Native deaths, the data presented cannot be used to compare the cause-specific mortality rates by Alaska Native status. For Alaska Native and non-Native infants, 56% and 59% of deaths, respectively, occurred during the neonatal period and the median age at death was 16.5 days for both groups.

Conclusions

Because of methodological limitations, cause-specific mortality rates cannot be compared by Alaska Native status. Nevertheless, in our sample the proportion of deaths due to specific causes differed by Alaska Native status. This may reflect actual differences in the cause of death or may be related to a number of biases. A larger proportion of all Alaska Native than non-Native deaths which occurred during 1992-96 were included. Additionally, the MIMR committee is limited by the information available in the medical and other records it reviews. This limitation may have led to ascertainment bias affecting the proportion of deaths associated with particular causes.

For example, providers delivering care to Alaska Native women may ascertain substance use status more commonly than providers delivering care to non-Natives; this would underestimate the proportion of non-Native deaths associated with maternal substance use. Similarly, the extent and methodology of death scene investigations for Alaska Natives and non-Natives may differ.

Recommendations

- The committee recommends continuing a complete Infant Mortality Review process that will include all infant deaths regardless of race or ethnicity. This may assist with promoting uniformity of care and postmortem investigations regardless of race or ethnicity; this in turn will further the goal of

accurately targeting intervention programs for specific populations.

Preventable infant deaths

Results

The committee determined that, based on the current state of medical knowledge, 42% of examined infant deaths were potentially preventable. The most common intervention which the committee believed might have prevented some infant deaths was parental education followed by social support and drug (including alcohol) cessation programs (Figure 3). The committee believed better medical management might have prevented 11% of deaths including better primary care management (four infants),

Figure 2. Proportion of Alaska Native (n=54) and non-Native (n=46) deaths due to committee assigned causes of death, allowing for multiple causes. Alaska MIMR, 1997 Review.

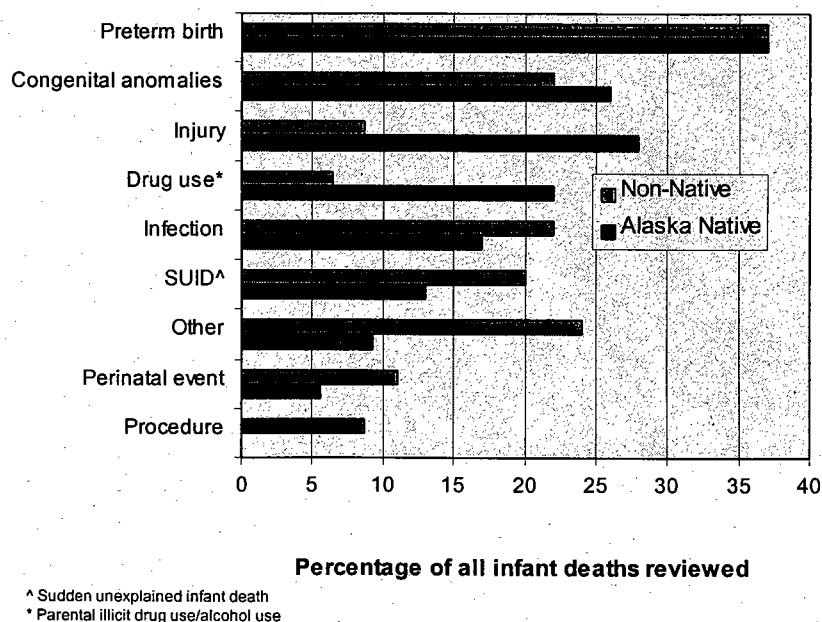
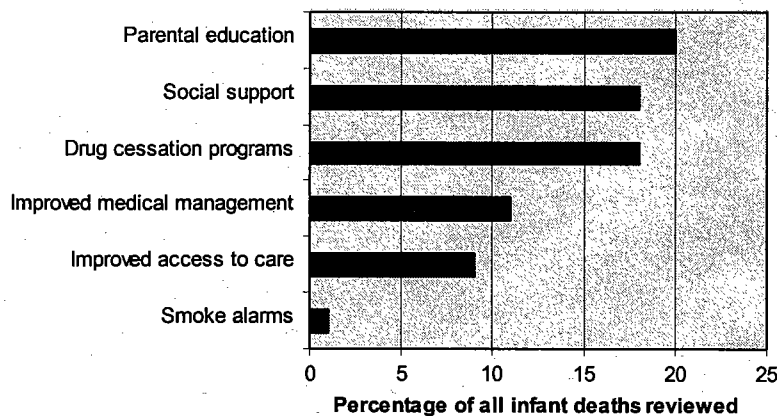


Figure 3. Percentage of infant deaths potentially preventable by specific interventions; Alaska MIMR, 1997 Review.



better obstetrics and gynecology or midwife management (two each), and better neonatal intensive care, emergency room, or anesthesia management (one infant each). The committee believed improved access to care might have prevented 9% of infant deaths, including access to initial care for six infants and to tertiary care for three infants. Four deaths were related to medical procedures during surgery and two of these were considered preventable by the committee.

Conclusions

The most commonly identified interventions fall into the broad category of sociocultural factors. Increasingly, these factors are recognized as the cornerstone for improving child health yet they are notoriously difficult to alter. The Alaska Healthy Families Program, an intensive home-based intervention program for mothers at high risk of abusing or neglecting their infants, addresses all three of the factors most commonly associated with

preventable infant death in Alaska: parental education, social support, and drug cessation. Telemedicine is a rapidly developing technology that may improve medical management of critically ill infants; to date, however, the effectiveness of telemedicine remains unproven and some have suggested it may actually have an adverse effect. As the data presented here demonstrate, access to care remains a problem for critically ill children, primarily because of the large number of small rural villages dependent on air travel

for transport to medical facilities. One infant's death may have been prevented if fire prevention education or a working smoke alarm had been present.

Recommendations

- ♦♦Support programs such as Healthy Families which take a comprehensive approach to intervening with at-risk families to improve family, including infant, health. (Healthy Families provides intensive support to women at high risk of abusing their infants, including women with a history of substance use; the project has been described in a previous issue of the *Dataline*).
- ♦♦Continue to cautiously explore the role of telemedicine for improving the access of rural medicine providers to critical medical information.
- ♦♦Encourage the acquisition of appropriate continuing medical education for all health care providers.
- ♦♦Explore methods for providing cost-effective access to care for rural populations.

Table 1. Contribution of prenatal or postnatal maternal illicit drug use or alcohol abuse to 15 infant deaths. Alaska MIMR, 1997 Review.

Pattern of Use	Number
Maternal illicit substance use with or without alcohol abuse in context of premature birth	4
Maternal cocaine or unspecified drug use associated with placental abruption	3
Alcohol abuse or illicit substance use led to unexplained asphyxial death, including possible intentional injury	3
Alcohol abuse contributed to overlying	2
Maternal alcohol abuse alone in context of premature birth	1
Alcohol abuse led to maternal loss of consciousness and subsequent drowning of child	1
Maternal alcohol abuse during pregnancy led to fetal alcohol syndrome and possibly lethal congenital heart disease	1

Table 2. Compared to all other deaths, risk factors for 15 infant deaths where prenatal or postnatal maternal illicit drug use or alcohol abuse was considered a preventable factor in the infant's death. Alaska MIMR, 1997 Review.

Risk Factor	Percentage where drug use contributed to death	Risk ratio (95% Confidence Interval)
<i>Maternal education (in years)</i>		
<12 (N=29)	31	Undefined (p=0.0026)*
12 (N=39)	15	Undefined (p=0.07)*
>12 (N=24)	0	Ref.
<i>Maternal Age (in years)</i>		
<20 (N=10)	20	2.5 (0.49, 13)
20-29 (N=52)	19	2.4 (0.72, 8.3)
≥30 (N=38)	7.9	Ref.

*Fisher's exact two-tailed p-values

Parental prenatal or postnatal illicit drug use or alcohol abuse as a contributing cause of death

Results

We conducted a more in-depth analysis of 15 infants for whom prenatal or postnatal parental illicit drug use or alcohol abuse (referred to collectively as substance use) was identified as a contributing cause of death or a potentially preventable factor in the infant's death. In all instances, substance use was associated with the mother, and in one case the father was also implicated. Substance use during pregnancy contributed to death through premature delivery and placental abruption while substance use after pregnancy contributed to death through overlying, mechanical asphyxiation (intent unknown), and drowning (Table 1). In addition to the 15 substance use-associated deaths, for seven other infants the committee made a recommendation to intervene in parental substance use, in all cases

but one maternal, but did not note that the substance use contributed to infant death.

Of the 15 women whose substance use potentially contributed to infant death, the median number of prenatal visits was 8 (range, 0 to 12), and only one woman had no prenatal care. Maternal education, but not age, was strongly associated with death associated with maternal substance use, compared to all other deaths (Table 2).

In addition to the 15 deaths associated with substance use, and the seven other instances where substance use by the parents was noted by the committee, we reviewed the MIMR computer data base and identified 14 other infant deaths where maternal substance use had been noted in the maternal or infant medical chart. Overall, for 36 deaths, there was a documented history of parental substance use (defined as substance use-noted), including maternal substance use for 35. As with substance use-associated deaths, substance use-noted deaths were related to maternal education but not age (Table 3).

Conclusions

Through a variety of mechanisms, prenatal and postnatal parental (primarily maternal) substance use contributed to 15% of the infant deaths in our cohort,

Table 3. Compared to all other infant deaths, risk factors for 36 infant deaths where prenatal or postnatal parental* illicit drug use or alcohol abuse was documented. Alaska MIMR, 1997 Review.

Risk Factor	Percentage with any drug use	Risk ratio (95% Confidence Interval)
<i>Maternal education (in years)</i>		
<12 (N=29)	72	5.8 (2.0, 17)
12 (N=39)	31	2.5 (0.77, 7.8)
>12 (N=24)	13	Ref.
<i>Maternal Age (in years)</i>		
<20 (N=10)	30	0.76 (0.27, 2.1)
20-29 (N=52)	35	0.88 (0.51, 1.5)
≥30 (N=38)	39	Ref.

* In all instances but one, the mother was implicated

Table 4. Risk Factors for Overlying as a Cause of Death. Alaska MIMR, 1997 Review.

Risk Factor	Percentage where overlying contributed to death	Risk ratio (95% Confidence Interval)
<i>Maternal education (in years)</i>		
<12 (N=29)	17	Undefined (p=0.056) [^]
12 (N=39)	13	Undefined (p=0.15) [^]
>12 (N=24)	0	Ref.
<i>Maternal Age (in years)</i>		
<20 (N=10)	20	2.5 (0.49, 13)
20-29 (N=52)	9.6	1.2 (0.31, 4.8)
≥30 (N=38)	7.9	Ref.
<i>Parental* prenatal or postnatal illicit drug use or alcohol abuse</i>		
Yes (N=36)	14	1.8 (0.55, 5.7)
No (N=64)	7.8	Ref.

*In all instances but one, the mother was implicated

[^]Fisher's exact two-tailed p-values

and was noted for an additional 21%. Women whose substance use contributed to the death of their infant had less education than other women, although it is unclear whether this represents a causal relationship. It is possible that programs to increase maternal education may have a beneficial effect on the infant mortality rate in Alaska. Interestingly, all women but one for whom substance use contributed to the death of their infant received prenatal care, and most received numerous visits. It is possible that prenatal care was not accurately reflected on the birth certificate and maternal medical records. Assuming that prenatal care data was reasonably accurate, our data suggest that prenatal care providers and the public health community may need to identify more effective ways of identifying and intervening with substance-using women during the prenatal period.

Recommendations

- ♦♦Identify and support programs that encourage women to obtain higher education, beyond high school equivalency, and to delay childbearing until that education is obtained. Although not specifically related to the information presented above, the committee wishes to emphasize the importance of maternal education for a wide range of infant and childhood health indicators.
- ♦♦Identify and support specific programs to limit parental substance use. These may include:
 - > Healthy Families Projects in Alaska.
 - > thorough service delivery and innovative perinatal counseling techniques to decrease maternal alcohol consumption.
 - > education of prenatal care

providers regarding the availability of drug intervention programs such as Dena A Coy.

- > safe houses for women during pregnancy.
- > improved access/availability to alcohol and drug treatment programs.
- > availability of affordable, trustworthy, and reliable child care services so that at-risk women can access mental health, substance use prevention, and educational programs.
- ♦♦ Collect systematically outcome-based data from the above programs to determine their effectiveness.
- ♦♦ Continue to refine the documentation of maternal and paternal substance use.

Overlying as a cause of death

Results

We also examined overlying as a cause of death in more detail. Any identification of prenatal or postnatal parental illicit drug use or alcohol abuse, less formal education, and young maternal age were all associated with assignment of death due to overlying when compared to all other deaths, although none of these associations were statistically significant at the 95% confidence interval (Table 4).

Conclusions

The committee believed that overlying was most probably a cause of death for 10% of infants whose deaths were reviewed. It should be emphasized that overlying is a particularly difficult

cause of death to ascertain with certainty unless the infant is found underneath another person, someone informs the legal or medical authorities of this fact, and those authorities note this information in official records. The State Medical Examiner's Office has reported that on occasion deceased infants have been removed from the death scene before completion of a death scene investigation. This impedes obtaining accurate information for cause of death determination.

Recommendations

- Support should be provided for programs directed at decreasing maternal and paternal substance use and improving parental education, to include safe sleeping arrangements.
- Prenatal and postnatal education should be provided to caretakers indicating that co-sleeping with their infant may lead to the infant's death if they are mentally impaired due to alcohol or illicit substance use.
- All out-of-hospital infant deaths should continue to have an appropriate death scene investigation by a trained official.
- Infant crib loan programs may decrease overlying deaths if high-risk co-sleeping (for example, with a substance-impaired caretaker) occurs in part because of the unavailability of cribs.
- Emergency medical personnel, paramedics, and other first responders should be trained to not remove deceased infants from a death scene. Upon identification of an infant death, first responders should

Table 5. The association between maternal experience of violence and infant death related to injury. Alaska MIMR, 1997 Review.

Maternal experience of violence	Percentage of infant deaths associated with injury	Risk ratio (95% Confidence Interval)
Yes (N=10)	40	7.9 (2.1, 30)
No (N=90)	5.1	Ref.

immediately inform the appropriate authorities so that an appropriate death scene investigation can be performed in a timely manner.

Injury other than overlying as a cause of infant death

Results

Other than overlying, nine infants had injury as a cause of death including mechanical suffocation possibly due to an inappropriate sleep environment for four infants, homicide for two infants (including one with shaken-baby syndrome), and accidental drowning, fire-related injuries, and premature delivery following maternal experience of domestic violence for one infant each. Other than the infants who died of homicide, evidence was not available to determine intent. All nine of the injury deaths were considered preventable.

We found that mothers with a history of experiencing violence were over seven times more likely to have an infant die of injury (other than overlying) than women with no history of experiencing violence (Table 5). All women with a history of experiencing violence had prenatal care during the first trimester and received an average

of 8.7 total prenatal visits; these values are similar to women with no history of experiencing violence.

Conclusions

In our sample, injury other than overlying was a frequent preventable cause of death. The reason for the association between a maternal history of experiencing domestic violence and subsequent injury death of the infant is unclear and deserves further exploration. For example, maternal experience of violence might be a marker for maternal or paternal neglect or abuse of the infant (if some of the deaths for which intent was not known were intentional), or poor maternal or paternal parenting skills. It is possible that interventions to address domestic violence against women of child-bearing age will have a beneficial effect on infant mortality as well. Women who experienced domestic violence received at least some prenatal care in all instances suggesting a possible avenue for intervention.

Recommendations

- The MIMR Committee supports increased funding for the State Medical Examiner's Office to supervise and coordinate the Child Fatality Review Team. In particular, the Committee supports increased funding for training

- of pathologists in pediatrics and funds for another forensic pathologist.
- ◆ Provide funding and support for Healthy Families Projects and other similar community-based projects in Alaska (e.g., Nutaqsiivik, an Alaska Native post-neonatal mortality reduction project based in the Anchorage area).
 - ◆ Prenatal care providers

- should improve their identification and documentation of the experience of violence among women through specific continuing education training and should intervene appropriately when at-risk women are identified.
- ◆ An agreement should be formalized with the Division of Family & Youth Services (the Alaska Youth Protective Services

- Division) to obtain information on abuse and neglect of children who die during infancy.
- ◆ Support should be provided to the Never Shake a Baby campaign.
 - ◆ The provision of funding and support to programs such as the Alaska Domestic Violence Training Project may have a beneficial effect on infant mortality.

*Submitted by
Brad Gessner MD, MPH,
and the MIMR Committee.*

Family Health *Dataline* is a monthly publication of the Alaska Department of Health and Social Services; Division of Public Health; Section of Maternal, Child, and Family Health, 1231 Gambell Street, Anchorage, AK 99501, (907) 269-3400 (fax) 269-3414.

State of Alaska Governor Tony Knowles
DHSS Commissioner Karen Perdue
DPH Director Peter M. Nakamura, MD, MPH
Section Chief Pam Muth, MPH

Editor Brad Gessner, MD, MPH
Design/Layout Judy Matricardi
Printing Alaska Printing



Vol. 4, No. 1

Family Health *Dataline*
State of Alaska, MCFH
1231 Gambell Street
Anchorage, Alaska 99501

Address Service Requested

BULK RATE
U.S. POSTAGE
PAID
ANCHORAGE, AK
PERMIT NO. 297